MECKLENBURG COUNTY CodeEnforcement

TECHNICAL DEVELOPMENT MEETING January 9, 2019

ELECTRICAL

Committed To:

QUALITY INSPECTION SERVICES AND EXCELLENT CUSTOMER SERVICE

Our Goal is:

TO PARTNER WITH CLIENTS AND CITIZENS TO ASSURE THE SAFETY OF PROJECTS AND BUILDINGS AND TO SERVE THE NEEDS OF OUR COMMUNITY

I. Customer Service Highlight:
II. Electrical Technical Discussion Topic: Contractor Continuing Education
NC Energy Conservation Code
NCSBC Changes to Special Inspections 1705.17
III. Electrical Questions and Answers:

1. I recently failed for providing an over-current device for a residential range larger than the installation instructions specified. The OCD was calculated and was within the allowed range for the appliance, should this have failed the inspection? The appliance was rated at 12.4KW and the breaker was a 50 ampere, the instructions specified a 40 ampere.
   A. NEC 110.3(B) does not allow any equipment to be installed outside the parameters of its listing and installation instructions.

(B) Installation and Use. Listed or labeled equipment shall be installed and used in accordance with any instructions included in the listing or labeling.

Manufacturers' listing and labeling installation instructions must be followed, even if the equipment itself is not required to be listed. For example, 210.52 permits permanently installed electric baseboard heaters to be equipped with receptacle outlets that meet the requirements for the wall space utilized by such heaters. The installation instructions for such permanent baseboard heaters indicate that the heaters should not be mounted beneath a receptacle. In dwelling units, the use of low-density heating units more than 12 feet in length is common. Therefore, to meet the requirements of 210.52(A) and also the installation instructions, a receptacle must either be part of the heating unit or be installed in the floor close to the wall but not above the heating unit. (Exhibit 210.26

and the Informational Note to 210.52 provide more specific details.)
Listing or labeling is the most common method of establishing suitability. This section does not require listing or labeling of equipment. Before approving the installation, the AHJ may require evidence of compliance with 110.3.
Some sections do require listed or labeled equipment. For example, 250.8 specifies "listed pressure connectors . . . pressure connectors listed as grounding and bonding equipment [or] . . . other listed means" as connection methods for grounding and bonding conductors.
Listing organizations typically require the use of their listing mark on the equipment as the means of determining if the product is listed. Where it is impractical to have the listing mark on the equipment, the listing organization will usually require that the listing mark be on the smallest unit container in which the product is packaged. Since 110.3(B) requires compliance with the listing requirements, the appropriate certification mark is required if that is a requirement of the listing entity.

Baring the instructions however, the range is calculated using the method detailed in article 220.51 and applying the demands of 422.11(E) to determine the over-current device.

2. Is it required to protect a residential closet on AFCI when the closet is only accessible through the Laundry room?
   A. NC has exempted the laundry area outlets as requiring AFCI protection in the amendments, however the AFCI is required in closets per 210.12(A)

3. Re-Visit and clarification on sizing dry-type transformers, from Nov. Consistency Meeting.

Copied from the November 2018 meeting;
On my current project, the engineer designed a 75 KVA transformer to feed 2 separate 200-amp panels, with 150-amp main circuit breakers. The load sheets indicate on has 116 amps and the other has 101 amps calculated connected load. The 75 KVA has a secondary ampere rating of 208 amps. Is this code compliant?

A. Yes, per. 450.3(B) notes 1 and 2, Discuss
   After review and reconsideration there is nothing in these sections that would allow a transformer to be installed to supply loads above its rating. The rated load is where the calculation starts, the 116 amperes and the 101-ampere load would require a transformer to have a minimum rating of 78120 watts, this would require a 112.5 KVA transformer. The overcurrent for the transformer can then be selected using the sections of 450.3(B) 1 and 2

4. As an inspector, are we required to check the conductor connections and any available settings within Electric Vehicle Charging equipment? What if the connections and adjustments are inaccessible on site without the contractor?

Discussion, A. The inspector must use all available resources to him/her to verify code compliance.

5. I have a project that has a portion of the electrical installation that will be completed by workmen from a local Gas utility company. The inspector has denied connection to my pole service, stating the work outside my scope must be permitted and inspected, or additional information is needed, prior to energizing my service. Isn't the Gas utility exempt from permitting, and inspections? Please provide clarification to the permitting and inspection requirements of cell tower and remote cell sites.

A. These type installations are exempt from permitting and inspections per the NC General Statutes

§ 143-138. North Carolina State Building Code.

(b8) Exclusion for Certain Utilities. - Nothing in this Article shall extend to or be construed as being applicable to the regulation of the design, construction, location, installation, or operation of (1) equipment for storing, handling, transporting, and utilizing liquefied petroleum gases for fuel purposes or anhydrous ammonia or other liquid fertilizers, except for liquefied petroleum gas from the outlet of the first stage pressure regulator to and including each liquefied petroleum gas utilization device within a building or structure covered by the Code, or (2) equipment or facilities, other than buildings, of a public utility, as defined in G.S. 62-3, a cable television company, or an electric or telephone membership corporation, including without limitation poles, towers, and other structures supporting electric, cable television, or communication lines.

GS 62-3 Definitions

(23) a. "Public utility" means a person, whether organized under the laws of this State or under the laws of any other state or country, now or hereafter owning or operating in this State equipment or facilities for:

1. Producing, generating, transmitting, delivering or furnishing electricity, piped gas, steam or any other like agency for the production of light, heat or power to or for the public for compensation; provided, however, that the term "public

utility" shall not include persons who construct or operate an electric generating facility, the primary purpose of which facility is for such person's own use and not for the primary purpose of producing electricity, heat, or steam for sale to or for the public for compensation;

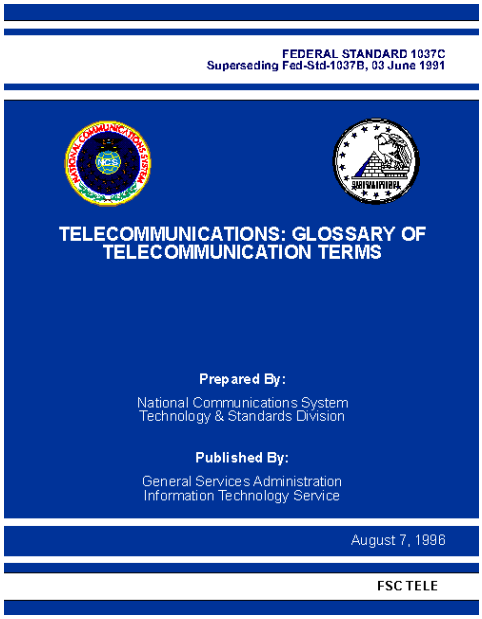
2. Diverting, developing, pumping, impounding, distributing or furnishing water to or for the public for compensation, or operating a public sewerage system for compensation; provided, however, that the term "public utility" shall not include any person or company whose sole operation consists of selling water to less than 15 residential customers, except that any person or company which constructs a water system in a subdivision with plans for 15 or more lots and which holds itself out by contracts or other means at the time of said construction to serve an area containing more than 15 residential building lots shall be a public utility at the time of such planning or holding out to serve such 15 or more building lots, without regard to the number of actual customers connected;
3. Transporting persons or household goods by street, suburban or interurban bus for the public for compensation;
4. Transporting persons or household goods by motor vehicles or any other form of transportation for the public for compensation, except motor carriers exempted in G.S. 62-260, carriers by rail, and carriers by air;
5. Transporting or conveying gas, crude oil or other fluid substance by pipeline for the public for compensation;
6. Conveying or transmitting messages or communications by telephone or telegraph, or any other means of transmission, where such service is offered to the public for compensation.

In { HYPERLINK "http://en.wikipedia.org/wiki/Telecommunication" \o "Telecommunication" }, a **facility** is defined by { HYPERLINK "http://en.wikipedia.org/wiki/Federal_Standard_1037C" \o "Federal Standard 1037C" } as:

1. A fixed, mobile, or transportable structure, including (a) all installed electrical and electronic wiring, cabling, and equipment and (b) all supporting structures, such as utility, { HYPERLINK "http://en.wikipedia.org/wiki/Ground_%28electricity%29" \o "Ground (electricity)" } { HYPERLINK "http://en.wikipedia.org/wiki/Telecommunications_network" \o "Telecommunications network" }, and electrical supporting structures.
2. A network-provided service to users or the network operating administration.
3. A { HYPERLINK "http://en.wikipedia.org/wiki/Transmission_%28telecommunications%29" \o "Transmission (telecommunications)" } pathway and associated equipment.
4. In a { HYPERLINK "http://en.wikipedia.org/wiki/Communications_protocol" \o "Communications protocol" } applicable to a { HYPERLINK "http://en.wikipedia.org/wiki/Data" \o "Data" } unit, such as a { HYPERLINK "http://en.wikipedia.org/wiki/Block_%28telecommunications%29" \o "Block (telecommunications)" } or { HYPERLINK "http://en.wikipedia.org/wiki/Frame_%28telecommunications%29" \o "Frame (telecommunications)" }, an additional item of { HYPERLINK "http://en.wikipedia.org/wiki/Information" \o "Information" } or a constraint encoded within the protocol to provide the required control.
5. A { HYPERLINK "http://en.wikipedia.org/wiki/Real_property" \o "Real property" } entity consisting of one or more of the following: a building, a structure, a utility { HYPERLINK "http://en.wikipedia.org/wiki/System" \o "System" }, pavement, and underlying land.{ HYPERLINK "http://en.wikipedia.org/wiki/Telecommunications_facility" \l "cite_note-1" }{ HYPERLINK "http://en.wikipedia.org/wiki/Telecommunications_facility" \l "cite_note-2" }

http://www.its.bldrdoc.gov/fs-1037/fs-1037c.htm

FEDERAL STANDARD 1037C



facility: 1. A fixed, mobile, or transportable structure, including installed electrical and electronic wiring, cabling, and equipment (b) all supporting structures, such as utility, { HYPERLINK "http://www.its.bldrdoc.gov/fs-1037/dir-017/_2494.htm" } { HYPERLINK "http://www.its.bldrdoc.gov/fs-1037/dir-024/_3511.htm" electrical supporting structures. ({ HYPERLINK "http://www.its.bldrdoc.gov/fs-1037/dir-001/_0063.htm" \l "188" }) network-provided service to users or the network operating { HYPERLINK "http://www.its.bldrdoc.gov/fs-1037/dir-002/_0178.htm" { HYPERLINK "http://www.its.bldrdoc.gov/fs-1037/dir-038/_5556.htm" } pathway and associated equipment. **4.** In a { HYPERLINK "http://www.its.bldrdoc.gov/fs-1037/dir-028/_4197.htm" applicable to a { HYPERLINK "http://www.its.bldrdoc.gov/fs-1037/dir-010/_1401.htm" } unit, such as a { HYPERLINK "http://www.its.bldrdoc.gov/fs-1037/dir-005/_0663.htm" } or { HYPERLINK "http://www.its.bldrdoc.gov/fs-1037/dir-016/_2313.htm" }, an additional item of { HYPERLINK "http://www.its.bldrdoc.gov/fs-1037/dir-019/_2720.htm" } or a constraint encoded within the protocol to provide the required control. **5.** A real property entity consisting of one or more of the following: a building, a structure, a utility { HYPERLINK "http://www.its.bldrdoc.gov/fs-1037/dir-036/_5255.htm" }, pavement, and underlying land. [{ HYPERLINK "http://www.its.bldrdoc.gov/fs-1037/dir-001/_0063.htm" \l "JP1" }]

(a) all and

}, and

2. A

}. **3.** A

}

6. If NM cable can be installed in Types 3, 4, and 5 constructions, in other structures than SF, 2F and MF occupancies, that would cover medical doctor's buildings. The inspector failed my installation, because I wired the patient care space lighting with NM and connected the switching per 517.13(B) Ex. 3. This is completely code compliant, if I must I will be contacting the state to seek a ruling!
   A. Good Luck! NM cannot be used in that installation because the prescriptive method requires 1) an insulated equipment grounding conductor, and 2) 517.13(A) requires installation in metal conduit or metallic sheath cable

7. I recently failed a FI on a SP because I did not have a device for the water bonding. There are no metal light niches, handrails or ladders on this residential pool. It is the standard metallic rebar frame with Gunite application. Is it required to have a separate metallic water bond?
   A. No, the pool shell is considered conductive and will provide the electrical continuity to the water

(B) Bonded Parts. The parts specified in 680.26(B)(1) through (B)(7) shall be bonded together using solid copper conductors, insulated covered, or bare, not smaller than 8 AWG or with rigid metal conduit of brass or other identified corrosion-resistant metal. Connections to bonded parts shall be made in accordance with 250.8. An 8 AWG or larger solid copper bonding conductor provided to reduce voltage gradients in the pool area shall not be required to be extended or attached to remote panelboards, service equipment, or electrodes.

(1) Conductive Pool Shells. Bonding to conductive pool shells shall be provided as specified in 680.26(B)(1)(a) or (B)(1)(b). Poured concrete, pneumatically applied or sprayed concrete, and concrete block with painted or plastered coatings shall all be considered conductive materials due to water permeability and porosity. Vinyl liners and fiberglass composite shells shall be considered to be nonconductive materials.

(a) *Structural Reinforcing Steel.* Unencapsulated structural reinforcing steel shall be bonded together by steel tie wires or the equivalent. Where structural reinforcing steel is encapsulated in a nonconductive compound, a copper conductor grid shall be installed in accordance with 680.26(B)(1)(b).

A conductive element that is part of the pool bonding system must be in direct contact with the pool water. Where bonded items such as ladders, rails, or underwater luminaires are in direct contact with the pool water and provide the required surface area, it is not necessary to provide another conductive element. A conductive pool shell in contact with the water also satisfies this requirement. However, where the pool does not include any of these items, it is necessary to install a conductive element. Devices have been specifically listed as a means to provide this contact with the pool water.

8. Is it permissible to install an Optional Standby transfer switch in a residential crawlspace?
   A. As the question is posed the answer would be a sounding “Maybe”. Typically a crawlspace would not be allowed, however if the area had the minimum headroom, access, illumination, and working space required, and if it was not exposed to conditions that could be hazardous to the equipment and persons, it may be ok to place the transfer equipment there. It basically is on a case by case scenario.
9. Is it required to have a Rapid Shutdown device for a remotely mounted PV system? The PV source circuits run underground from the rack mounted array to the basement of the residence, through to the PV disconnecting Means and then to the exterior service equipment.
   A. Yes, Rapid Shutdown is required for all PV systems installed on buildings or that have PV source circuits installed on or within buildings

690.12 Rapid Shutdown of PV Systems on Buildings. PV system circuits installed on or in buildings shall include a rapid shutdown function to reduce shock hazard for emergency responders in accordance with 690.12(A) through (D).

Exception: Ground-mounted PV system circuits that enter buildings, of which the sole purpose is to house PV system

equipment, shall not be required to comply with 690.12.

First responders must contend with elements of a PV system that remain energized after the service disconnect is opened. This rapid shutdown requirement reduces the potential for shock within 30 seconds of activation of shutdown. Methods and designs for achieving proper rapid shutdown are not addressed by the *NEC* but instead are addressed in the product standards for this type of equipment.

10. When relocating a main panel that has a subpanel fed with a 3-conductor cable, is it required to replace the original 3 conductor cable? What if replacement would affect the building finishes?

A. NC Amendment 250.142(B) New exception 5, must be addressed on a case by case basis.

AMENDMENT 250.142(B)
Amend NEC 2017, page 126:
(B) Load-Side Equipment. Except as permitted in 250.30(A)(1) and 250.32(B) Exception, a grounded circuit conductor shall not be used for grounding non–current-carrying metal parts of equipment on the load side of the service disconnecting means or on the load side of a separately derived system disconnecting means or the overcurrent devices for a separately derived system not having a main disconnecting means.
Exception No. 1: The frames of ranges, wall-mounted ovens, counter-mounted cooking units, and clothes dryers under the conditions permitted for existing installations by 250.140 shall be permitted to be connected to the grounded circuit conductor.
Exception No. 2: It shall be permissible to ground meter enclosures by connection to the grounded circuit conductor on the load side of the service disconnect where all of the following conditions apply:
(1) No service ground-fault protection is installed.
(2) All meter enclosures are located immediately adjacent to the service disconnecting means.
(3) The size of the grounded circuit conductor is not smaller than the size specified in Table 250.122 for equipment grounding conductors.

Exception No. 3: Direct-current systems shall be permitted to be grounded on the load side of the disconnecting means or overcurrent device in accordance with 250.164.
Exception No. 4: Electrode-type boilers operating at over 1000 volts shall be grounded as required in 490.72(E)(1) and 490.74.
(1)

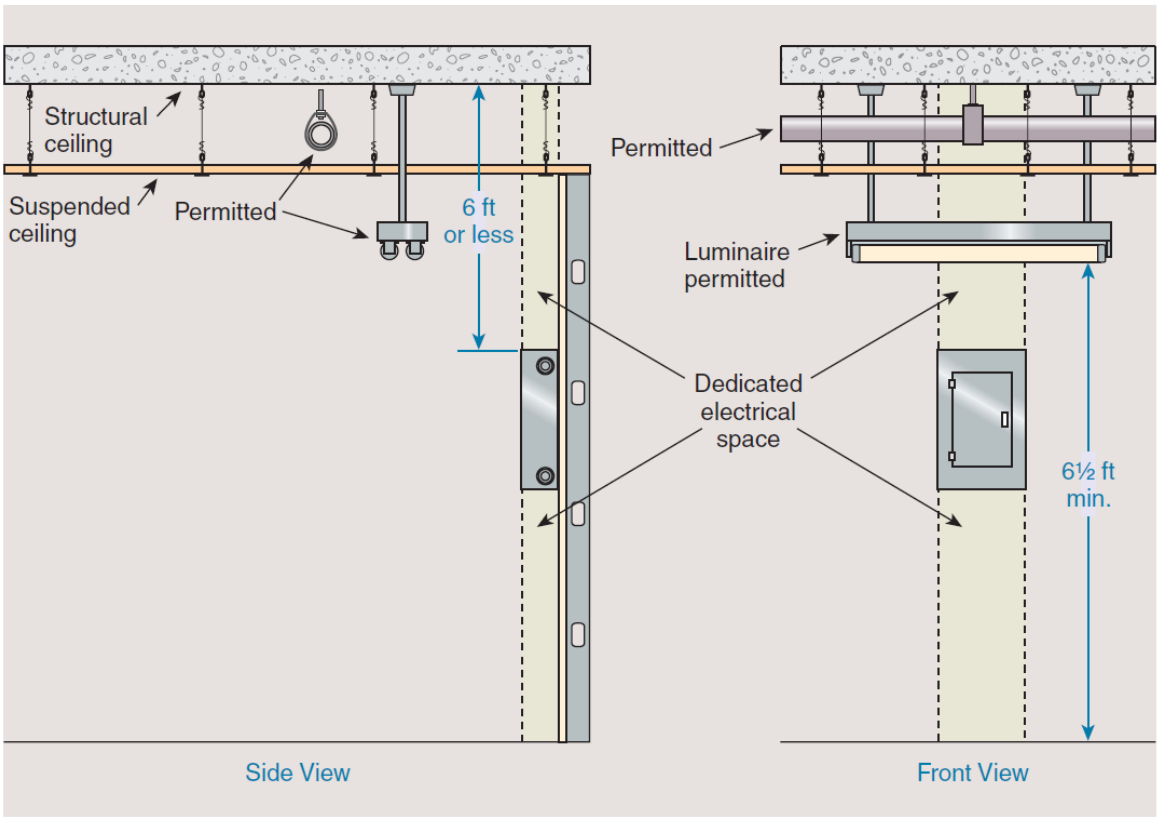
Exception No. 5: It shall be permissible to ground an existing panelboard enclosure by connection to the grounded circuit conductor for a one- and two-family dwelling where all the following conditions apply:
(1) When relocating or installing an additional main disconnecting means;
(2) Enacting 250.142(B) Exception No. 5: (1) redefines the existing service entrance conductors as a feeder as set forth in Article 100;
(3) An equipment grounding conductor in the existing panelboard is not present;
(4) Replacement of the existing service entrance conductors either requires the removal of the building finish or is deemed impractical by the authority having jurisdiction.
(5) All grounding electrode conductors are removed completely from the existing panelboard; and
(6) The grounded conductors are insulated by tape, heat-shrink, or other approved means except where covered by the sheathing of a cable assembly or as needed for joints, splices, and termination purposes.

11. My panel board installation was turned down since I had air ducts run directly over them violating the required 6’ of dedicated space above the panels per NEC 110.26 E1 (A). May I

install a hard ceiling above the panel boards to get around this? The ducts cannot be moved, and I mounted the panels as shown on the stamped drawings.

A. 110.26 **(E) Dedicated Equipment Space.** All switchboards, switchgear, panelboards, and motor control centers shall be located in dedicated spaces and protected from damage.
Exception: Control equipment that by its very nature or because of other rules of the Code must be adjacent to or within sight of its operating machinery shall be permitted in those locations.
(1) Indoor. Indoor installations shall comply with 110.26(E)(1)(a) through (E)(1)(d).
(a) *Dedicated Electrical Space.* The space equal to the width and depth of the equipment and extending from the floor to a height of 1.8 m (6 ft) above the equipment or to the structural ceiling, whichever is lower, shall be dedicated to the electrical installation. No piping, ducts, leak protection apparatus, or other equipment foreign to the electrical installation shall be located in this zone.
Exception: Suspended ceilings with removable panels shall be permitted within the 1.8-m (6-ft) zone.
(b) *Foreign Systems.* The area above the dedicated space required by 110.26(E)(1)(a) shall be permitted to contain foreign systems, provided protection is installed to avoid damage to the electrical equipment from condensation, leaks, or breaks in such foreign systems.
(c) *Sprinkler Protection.* Sprinkler protection shall be permitted for the dedicated space where the piping complies with this section.
(d) *Suspended Ceilings.* A dropped, suspended, or similar ceiling that does not add strength to the building structure shall not be considered a structural ceiling.

As you can see in the above article, part (d) Suspended Ceiling. It states that the ceiling must add strength to the building structure. A suspended ceiling does not meet that requirement, see the illustration below. However, if you added a hard ceiling to the bottom side of roof trusses, that would add strength to the building structure. See the illustration below:



12. Does a mail kiosk, at an apartment complex, require a disconnect, if it is lighted?

A.

Yes, per **225.32 Location.** The disconnecting means shall be installed either inside or outside of the building or structure served or where the conductors pass through the building or structure. The disconnecting means shall be at a readily accessible location nearest the point of entrance of the conductors. For the purposes of this section, the requirements in 230.6 shall be utilized.

Exception No. 1: For installations under single management, where documented safe switching procedures are established and maintained for disconnection, and where the installation is monitored by qualified individuals, the disconnecting means shall be permitted to be located elsewhere on the premises.

Exception No. 2: For buildings or other structures qualifying under the provisions of Article 685, the disconnecting means shall be permitted to be located elsewhere on the premises.

Exception No. 3: For towers or poles used as lighting standards, the disconnecting means shall be permitted to be located elsewhere on the premises.

Exception No. 4: For poles or similar structures used only for support of signs installed in accordance with Article 600, the disconnecting means shall be permitted to be located elsewhere on the premises.

Although the requirement for locating the disconnecting means for a feeder or branch circuit supplying a structure is essentially the same as that specified for services in 230.70(A), there is an important difference. Where a building or structure is supplied by a feeder or branch circuit, an outside feeder or branch-circuit disconnecting means must always be at the building or structure supplied, unless one of the conditions in Exception No. 1 through Exception No. 4 to 225.32 can be applied.

13. Is a disconnect required to be within sight, on the primary side of a 75KVA transformer? If the disconnect is located remotely, can I use the panel door lock, as a means of locking out the overcurrent protection, for the disconnect?

A. Yes and no. **450.14 Disconnecting Means.** Transformers, other than Class 2 or Class 3 transformers, shall have a disconnecting means located either in sight of the transformer or in a remote location. Where located in a remote location, the disconnecting means shall be lockable in accordance with 110.25, and its location shall be field marked on the transformer. **110.25 Lockable Disconnecting Means.** If a disconnecting means is required to be lockable open elsewhere in this *Code*, it shall be capable of being locked in the open position. The provisions for locking shall remain in place with or without the lock installed.

14. Does Tritium exit lights (exit light only) qualify as a 700 system? NCBC 1011.4 allows for internally illuminated exit signs using Tritium.

A. NCSBC does contain language that describes exit signs that are *self-luminous* or *photoluminescent* leading one to ponder where these could be installed. The majority of the code sections deal with the exit light to be "Illuminated at all times" requiring the exit light to be provided with a backup power source, in the event of loss of primary power source. It refers compliance to Chapter 27 which details the need for alternate sources of power. As a result the *photoluminescent* would be utilized in areas without power sources similar to the Renaissance Festival.

1013.5 Internally illuminated exit signs. Electrically powered, *self-luminous* and *photoluminescent* exit signs shall be *listed* and *labeled* in accordance with UL 924 and shall be installed in accordance with the manufacturer's instructions and Chapter 27. Exit signs shall be illuminated at all times.

1013.6.3 Power source. Exit signs shall be illuminated at all times. To ensure continued illumination for a duration of not less than 90 minutes in case of primary power loss, the sign illumination means shall be connected to an emergency power system provided from storage batteries, unit equipment or an on-site generator. The installation of the emergency power system shall be in accordance with Chapter 27.

Exceptions:

1. *Approved* exit sign illumination means that provide continuous illumination independent of external power sources for a duration of not less than 90 minutes, in case of primary power loss, are not required to be connected to an emergency electrical system.
2. Group I-2 Condition 2 exit sign illumination shall

not be provided by unit equipment battery only.

15. Smoke detector in bonus room with 1 step rise in elevation on second floor

A. One step does not constitute another level, the code language identifies levels as stories and the prescriptive code can identify a story as 10 feet. To clarify we can accept that another level would begin at 5 risers or more to ere on the safe side.

16. Carbon / smoke outside a bedroom with a hall with a cased opening

A. A CO/SM detector is required outside each sleeping area in a residence. Discuss

17. I was turned down for having my receptacle for the dishwasher behind the dishwasher. I have a switch ahead of the receptacle, what gives?

A. 422.16(B)(2)(6) Receptacle for D/W must be in cabinet space adjacent to D/W

18. Pool contractor removing AFCI to make room for his pool panel breaker.

Discussion; During inspections performed on additions or alterations verification should be made that alterations to existing electrical installations do not cause previously approved systems to be rendered non-compliant. It is reported that some contractors have removed AFCI breakers and installed piggyback type breakers to allow adding additional circuits.

19. Can Fire resistant/fire block foam be used to seal a short nipple inside an electrical panel or meter? I have heard that this is a combustible product and wanted to know if it was ok in this application.

A. Draft-stop is required when passing through the exterior to interior section of structures, the material must be approved for contact to the conductor and should be flame resistant.

20. When wiring a townhome, I was turned down for running NM cable in the void between the back of the 2x4 wall studs and the firewall between 2 townhomes. I don't see anything in the NEC that addresses this. Could you please explain the reason? Or was the inspector wrong?

A. Maybe, the area of separation wall must be self-supporting on either side with the ability to not be affected by hazards occurring to be transmitted through the wall. As a result, there is a prescriptive minimum distance between any combustible material and the metal studs supporting the fire barrier membrane. Usually a ¾ in minimum separation gap.

21. Am I required to install a bushing on a short PVC sleeve/nipple between a back to back meter and panel with SE cable ran through it? What if I use THHN?

A. 352.46 requires a bushing to be installed on PVC conduit installations, however sound judgment would dictate that this be applied where conductors are pulled through complete conduit systems exposing them to damage from the absence of the smooth rounded edge.